MARKED-UP SPECIFICATION:

The sampling unit 22 suitable for use in conjunction with the aerosol TOF MS 32 of the present invention is shown in Fig. 2 and described in more detail in pending U.S. Patent Application No. 10/782,132 filed on Feb. 18, 2004 by the same ~~applicants~~applicant. This unit, that produces trains of uniformly-sized particles D, contains a micro pump 38, which is connected to a signal source 42 for supplying the pump 38 with an electrical signal required for controlling the particle repetition rate or frequency. The micro pump 38 has an outlet port 44 connected to narrow tube 45 for ejecting particles D.

One of the most important parts of the aerosol TOF MS 32 is an electrostatic spiral quadrupole ion optics unit 270, which hereinafter will be referred to as a spiral quadrupole optics. Although with some differences, this unit is described in US Patent Application No. 058153 filed by ~~one of the applicants~~applicant of the present application in 2002. Since the spiral quadrupole optics 270 plays an important role in the aerosol TOF MS 32, this unit will now be ~~describe~~described in detail.

In each lens the absolute value of the potential difference between each pair of diametrically opposite poles in equal to 40 V (i.e., [-20V + (-20V)]. Furthermore, in each subsequent lens in the direction of propagation of the ions the potential in the center of the lens will be reduced. It is well known that in an electric field charges ~~s~~ move in the direction of the field gradient. Therefore in the aforementioned helical electrostatic quadrupole field, the ions will move along helical trajectories. Such trajectories are well known for movement of electrons in electron cyclotron resonance (ECR) as well as in the

Penning plasma. However, in ECR and in the Penning plasma, the aforementioned helical movement of electrons has an entirely different physical nature and is caused by the draft of the charge in a magnetic field. In the ~~of our~~invention, however, the helical trajectory of positively-charged ions results from a specific structure of the electric field in the absence of the magnetic field. Therefore, the aforementioned helical movements should not be confused.